

MASTER Economics Mathematics for economists

| Contacts | Description | Information |
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CONTENT

The course intends to deepen the understanding of optimization theory with a geometric approach, and to introduce in a second part the study of dynamical systems.

Course outline

I. Optimization with mixed constraints a. Tangent cone and KKT conditions b. Mixed constraints problem c. Constraints qualification conditions d. Convex problems e. Saddle point and duality

II. Dynamical systems a. Introduction b. Systems of linear equations

- Constant coefficient : resolution, exponential of matrices
- Dynamic of the solutions : steady state, stability, planar systems
- nonhomogeneous systems c. Systems of nonlinear differential equations
- Existence and uniqueness theorem
- Linearized system, Hartman-Grobman theorem

PROFESSIONAL SKILLS

- Solving optimization problems
- Quantitative and qualitative study of linear systems of differential equations
- Qualitative study on non-linear systems of o.d.e.

BIBLIOGRAPHY

- Mathematics for Economics, Simon & Blume, W. W. Norton & Company, International student edition (2010)
- Convex analysis and minimization algorithms : part I, J.-B. Hiriart-Urruty, C. Lemarchal, Springer (1996)

- Introduction à l'analyse numérique matricielle et à l'optimisation, Philippe G. Ciarlet, Sciences Sup Dunod (2000)
- Differential equations and dynamical systems, L. Perko, Springer Verlag, 1991
- Equations différentielles ordinaires, V.I. Arnold, MIR, 1984
- Differential Equations : a dynamical systems approach, J.H. Hubbard, B.H. West, Springer Verlag, part I 1991, part II 1995

ORGANISATION

24h Course
Mid term exam + Final exam

FUNDAMENTAL PREREQUISITES

- Basic differential calculus, linear differential equations of order 1, optimization without constraint
- Linear algebra : matrices, matrix diagonalization, linear maps

RECOMMENDED PREREQUISITES

- Use of convexity for solving optimization problems

VOLUME OF TEACHINGS

- Lectures: 24 hours

TRAININGS

Master's degree: Economics

- Empirical and theoretical economics
- Economic policy analysis
- Econometrics, big data, statistics
- Quantitative finance and insurance

